CLAIMS

WHAT IS CLAIMED IS:

1. A method for producing an event descriptor relating to at least one system, comprising the steps of:

(A) obtaining time series data of at least one index derived from at least one system;

(B) providing at least one characteristic behaviour relating to the index; and

(C) extracting a portion having the characteristic behaviour in the times series data as an event timing to produce an event descriptor described by the event timing.

2. A method according to claim 1, wherein the system is biological.

3. A method according to claim 1, wherein the system is a portion of a biological entity selected from the group consisting of biological body, organ, tissue, cell population, cell and cellular organelle.

4. A method according to claim 1, wherein the system is a cell.

5. A method according to claim 1, wherein the system is a social organization.

6. A method according to claim 1, wherein the system is an economic system.

7. A method according to claim 1, wherein the index is selected from the group consisting of a natural scientific

index, a technical index, a social scientific index, and a human scientific index.

8. A method according to claim 1, wherein the index is related to at least one state selected from the group consisting of a differentiation state, a response to a external agent, a cellular cycle state, a proliferation state, an apoptosis state, a response to a circumstantial change and an aging state.

9. A method according to claim 1 wherein the index comprises at least one selected from the group consisting of a gene expression level, a gene transcription level, gene a post-translational modification level, chemical level present intracellularly, an intracellular ion level, cell size, a biochemical process level, and a biophysical process level.

10. A method according to claim 1, wherein the index comprises at least one selected from the group consisting of a gene expression level and a gene transcription level.

11. A method according to claim 1 wherein the index comprises a gene transcription level.

12. A method according to claim 1, wherein the characteristic behaviour comprises at least on selected from the group consisting of: coincidence of the time-series data and a predetermined value, or a specific variation or no change of the absolute value change rate thereof; coincidence of a first-order differentiation value of the time-series data and a predetermined value, or a specific variation or no change of the absolute value change rate

thereof; coincidence of a second-order differentiation value of the time-series data and a predetermined value, or a specific variation or no change of the absolute value change rate thereof; change in sign (+/-) of the time-series data; change in sign (+/-) of the first-order differentiation value of the time-series data; change in sign (+/-) of the second-order differentiation value of the time-series data; coincidence of the time-series data and time-series data of another index; coincidence of the first-order differentiation of the time-series data and the first-order differentiation of time-series data of another index; coincidence of the second-order differentiation of the time-series data and the second-order differentiation of time-series data of another index; coincidence of sign (+/-) of the time-series data and the sign of time-series data of another index; coincidence of sign (+/-) of the first-order differentiation value of the time-series data and the sign of the first-order differentiation value of time-series data of another index; coincidence of sign (+/-) of the second-order differentiation value of the time-series data and the sign of the second-order differentiation value of time-series data of another index; coincidence of the time-series data and another time-series data of the index; coincidence of the first-order differentiation of the time-series data and the first-order differentiation of another time-series data of the index; and coincidence of the second-order differentiation of the time-series data and the second-order differentiation of another time-series data of the index.

13. A method according to Claim 1, wherein the characteristic behaviour is the change of the sign of the first-order differentiation value of the time-series data.

14. A method according to claim 1, wherein the time-series data is continuous or discontinuous.

15. A method according to claim 1, wherein the time-series data is described in relative time or absolute time.

16. A method according to claim 1, wherein the time series data is described in such a manner that the initiation time of observation is expressed as a reference (0).

17. A method according to claim 1, wherein the time-series data is expressed as a relative or absolute level.

18. A method according to claim 1, wherein the time-series data are those of a genetic expression level, and the genetic expression level is an expression level of a flucorescent protein.

19. A method according to claim 1, wherein the time-series data are normalized data.

20. A method according to claim 1 wherein the event timing is expressed as a time point or a time range.

21. A method according to claim 1, wherein the event timing is within a shift or within a time range of 12 hours or less.

22. A method according to claim 1, wherein the event timing is within a shift or within a time range of one hour or less.

23. A method according to claim 1, further comprising the step of mathematically processing the time series data.

24. A method according to claim 23, wherein the mathematical process is selected from the group consisting of normalization, first-order differentiation, second-order differentiation, third-order differentiation, linear approximation, non-linear approximation, moving average, noise filter, Fourier's transform, fast Fourier's transform and principal component analysis.

25. A method according to claim 1, wherein the event timing is calculated based on raw data of the time series data.

26. A method according to claim 1, wherein the event timing is calculated based on the first-order differentiation of the time series data.

27. A method according to claim 1, wherein the event timing is calculated based on the second-order differentiation of the time series data.

28. A method according to claim 1, wherein the event timing is calculated based on the coincidence of increase or decrease per unit time in a plurality of time series data.

29. A method according to claim 28, wherein each of the unit time are identical or different.

30. A method according to claim 1, wherein the event timing is represented in the increase, decrease or unchanged status of the index.

31. A method according to claim 1, wherein the event timing is represented by the expression manner of (time t, the

increase, decrease or unchangeness of the index <+, - or 0>).

32. A method according to claim 31, wherein the time t is represented by a time point or time range.

33. A method according to claim 1, wherein the event descriptor is represented by aligning characters or letters related to the event timing in an order of time points.

34. A method according to claim 1, wherein the description relating to the event timing is represented by means of A, T, G or C, which are single letter designators of nucleic acids in an order of time points.

35. A method according to claim 1, wherein the increase or decrease in the index is characterized in that the point at which the sign of the first-order differentiation is changed, the sign of the second-order differentiation is changed, or the case where the value of raw data is significantly changed in an experiment, are indicative of the increase or decrease.

36. A method according to claim 1, wherein the increase or decrease in the index is characterized in that the point at which the sign of the first-order differentiation is changed, the sign of the second-order differentiation is changed, or the case where the value of raw data is significantly changed in an experimental system, in a normalized form of the time-series data.

37. A method according to claim 1, wherein at least two indices are used as the index, and, as the event timing,

those at which the behaviors of increase or decrease coincide with respect to the increase/decrease of the index at at least one point in at least two types of indices.

38. A method according to claim 1, wherein sign change in first-order differentiation and sign change in second-order differentiation are used as the characteristic behavior, and a first letter/character corresponding to the sign change of the first-order differentiation and a second letter corresponding to the sign change of the second-order differentiation are represented in a form of a character string according to the time order as the event descriptor.

39. A method according to claim 1, wherein sign change in first-order differentiation and sign change in second-order differentiation are used as the characteristic behavior, and a first letter/character corresponding to the sign change of the first-order differentiation, a second letter corresponding to the sign change of the second-order differentiation and a third letter/character corresponding to another letter/character regarding the time without sign change are represented in the form of a character string according to the time order as the event descriptor.

40. A method according to claim 1, wherein sign change in raw data is used as the characteristic behavior, and a first letter/character corresponding to the increase in the raw data, and a second letter/character corresponding to the decrease in the raw data, are represented in a form of a character string according to the time order as the event descriptor.

41. A method according to claim 1, wherein sign change in

raw data is used as the characteristic behavior, and a first letter/character corresponding to the increase in the raw data, a second letter/character corresponding to the decrease in the raw data, and a third letter/character corresponding to another character/letter regarding the time without increase or decrease are represented in a form of a character string according to the time order as the event descriptor.

42. A method according to claim 1, wherein the event descriptor is described with the notation selected from the group consisting of electric wave, magnetic wave, sound, light, color, image, number and character/letter.

43. A method according to claim 1, wherein the event descriptor is notated by characters or letters.

44. A method according to claim 1, further comprising the step of recording the event descriptor on a storage medium.

45. A method for analyzing at least one system using an event descriptor relating to the system, comprising the steps of:

(A) obtaining time-series data of at least one index derived from at least one system;

(B) providing at least one characteristic behavior;

(C) extracting a portion having the characteristic behaviour as an event timing in the time-series data; and

(D) analyzing the at least one event descriptor.

46. A method according to claim 45, wherein the analysis uses an algorithm.

47. A method according to claim 45, wherein the algorithm comprises one selected from the group consisting of self-organization mapping, cluster analysis, genetic algorithm, alignment analysis, and parsing in a natural language processing.

48. A method according to claim 48, wherein the algorithm comprises a genetic algorithm.

49. A method according to Claim 45, wherein the system is a biological system.

50. A method according to Claim 45, wherein the system is a cell.

51. A method for analyzing the relationship between a first index and a second index in a system, comprising the steps of:

(A) producing a first event descriptor relating to a first index using a method according to claim 1;

(B) producing a second event descriptor relating to a second index using a method according to claim 1; and

(C) comparing the first and second event descriptors obtained in steps (A) and (B).

52. A method according to claim 51, wherein the comparison in the step (c) is conducted by production of coincidence event timing whose behaviors coincide in the first and second event descriptors.

53. A method for analyzing the relationship between a first index from a first system and a second index from a second system, comprising the steps of:

(A) producing a first event descriptor relating to a first index using a method according to claim 1;

(B) producing a second event descriptor relating to a second index using a method according to claim 1; and

(C) comparing the first and second event descriptors obtained in the steps (A) and (B).

54. A method for analyzing the relationship between indices at a first and second time points from a system, comprising the steps of:

(A) producing a first event descriptor relating to the first time point using a method according to claim 1;

(B) producing a second event descriptor relating to the second time point using a method according to claim 1; and

(C) comparing the first and second event descriptors obtained in the steps (A) and (B).

55. A method for analyzing an index from a system using an event descriptor obtained using first and second characteristic behaviors, comprising the steps of:

(A) producing a first event descriptor relating to a first index using a method according to claim 1;

(B) producing a second event descriptor relating to a second index using a method according to claim 1; and

(C) comparing the first and second event descriptors obtained in the steps (A) and (B).

56. A method according to claim 55, wherein the step of comparison comprises the step of extracting an event timing which coincides at a time point between the event timing in the first event descriptor and the event timing of the second event descriptor.

57. A production system for producing an event descriptor relating to a system, comprising:

i) monitoring means for monitoring at least one index relating to the system in a time-lapse manner; and

ii) descriptor production means for producing an event descriptor by producing a time-series data of the system from a signal obtained from the monitoring means, and calculating the time-series data; wherein the descriptor production means

(A) obtains time series data of at least one index derived from at least one system;

(B) provides at least one characteristic behaviour relating to the index; and

(C) extracts a portion having the characteristic behaviour in the time series data as an event timing to produce an event descriptor described by the event timing.

58. A production system according to claim 57, wherein the system is a cell, and the production system further comprises a support capable of maintaining a certain environment around the cell.

59. A production system according to claim 57, wherein the monitoring means is selected from the group consisting of an optical microscope,a fluorescent microscope, reading devices using a laser light source, surface plasmon resonance (SPR) imaging, reading devices of a signal derived from a means using electric signals, chemical or biochemical markers or a combination thereof, CCD camera, autoradiography, MRI and sensors.

60. A production system according to claim 57, wherein the

monitoring means comprises means for outputting a signal.

61. A production system according to claim 57, wherein the descriptor production means comprises means for producing the time-series data, and means for producing the descriptor by conducting the calculation step.

62. A production system according to claim 57, wherein the descriptor production means comprises a computer implementing a program instructing performing the steps of (A) through (C).

63. A production system according to claim 57, wherein the descriptor further comprises display means for displaying the descriptor.

64. A production system according to claim 63, wherein the display means has functions displaying a notation selected from the group consisting of an electric wave,a magnetic wave, sound, light, color, image, number and character/letter.

65. A production system according to claim 63, wherein the display means has a letter/character displaying function.

66. A production system according to claim 57, further comprising means for recording the event descriptor on a storage medium.

67. An event descriptor for describing a system, comprising a portion having at least one characteristic behavior as an event timing relating to at least index derived from at least one system.

68. An event descriptor produced by a method according to claim 1.

69. An analysis system for analyzing a system using a descriptor relating thereto, comprising:

i) monitoring means for monitoring at least one index relating to the system in a time-lapse manner;

ii) descriptor production means for producing an event descriptor by producing a time-series data of the system from a signal obtained from the monitoring means, and calculating the time-series data; and

iii) analysis means for analyzing the descriptor, wherein the descriptor production means

(A) obtains time series data of at least one index behavior derivied from at least one system;

(B) provides at least one characteristic behavior relating to the index; and

(C) extracts a portion having the characteristic behavior in the times series data as an event timing to produce an event descriptor described by the event timing.

70. An analysis system according to claim 69, wherein the analysis means has a function of analyzing at least one event descriptor with an algorithm analysis.

71. A method for analyzing a system using a sequence of event descriptors relating to at least one system, comprising the steps of:

(A) obtaining time-series data of at least one index derived from at least one system;

(B) providing at least one characteristic behavior;

(C) extracting a portion having the characteristic behavior as an event timing in the time-series data, and producing an event descriptor describing the event timing as a sequence; and

(D) analyzing the sequence.

72. A method according to claim 71, wherein the analysis of sequence uses genetic algorithm.

73. An analysis system for analyzing a system using a sequence of event descriptors relating to at least one system, comprising:

i) monitoring means for monitoring at least one index relating to the system in a time-lapse manner;

ii) descriptor production means for producing an event descriptor by producing a time-series data of the system from a signal obtained from the monitoring means, and calculating the time-series data to produce an event descriptor describing the event timing as a sequence; and

iii) analysis means for analyzing the sequence,

wherein the descriptor production means

(A) obtains time series data of at least one index derived from at least one system;

(B) provides at least one characteristic behavior relating to the index; and

(C) extracts a portion having the characteristic behavior in the times series data as an event timing to produce an event descriptor described by the event timing.

74. An analysis system according to claim 73, wherein the analysis of the sequence uses genetic algorithm.

75. A program for implementing a computer a process for producing an event descriptor relating to at least one system, the process comprises the steps of:

(A) obtaining time series data of at least one index derived from at least one system;

(B) providing at least one characteristic behavior relating to the index; and

(C) extracting a portion having the characteristic behavior in the times series data as an event timing to produce an event descriptor described by the event timing.

76. A program for implementing a computer a process for analyzing at least one system using an event descriptor relating to the system, the process comprising the steps of:

(A) obtaining time-series data of at least one index derived from at least one system;

(B) providing at least one characteristic behavior;

(C) extracting a portion having the characteristic behavior as an event timing in the time-series data; and

(D) analyzing the at least one event descriptor.

77. A program for implementing a computer a process for analyzing the relationship between a first index and a second index in a system, the process comprising the steps of:

(A) producing a first event descriptor relating to a first index using a method according to claim 1;

(B) producing a second event descriptor relating to a second index using a method according to claim 1; and

(C) comparing the first and second event descriptors obtained in the steps (A) and (B).

78. A program for implementing a computer a process for

analyzing the relationship between a first index from a first system and a second index from a second system, the process comprising the steps of:

(A) producing a first event descriptor relating to a first index using a method according to claim 1;

(B) producing a second event descriptor relating to a second index using a method according to claim 1; and

(C) comparing the first and second event descriptors obtained in the steps (A) and (B).

79. A program for implementing a computer a process for analyzing an index from a system using an event descriptor obtained using first and second characteristic behaviors, the process comprising the steps of:

(A) producing a first event descriptor relating to a first index using a method according to claim 1;

(B) producing a second event descriptor relating to a second index using a method according to claim 1; and

(C) comparing the first and second event descriptors obtained in the steps (A) and (B).

80. A program for implementing in a computer a process for analyzing a system using a sequence of event descriptors relating to at least one system, the process comprising the steps of:

(A) obtaining time-series data of at least one index derived from at least one system;

(B) providing at least one characteristic behavior;

(C) extracting a portion having the characteristic behavior as an event timing in the time-series data, and producing an event descriptor describing the event timing as a sequence; and

(D) analyzing the sequence.

81. A storage medium storing a program for implementing in a computer a process for producing an event descriptor relating to at least one system, the process comprises the steps of:

(A) obtaining time series data of at least one index derived from at least one system;

(B) providing at least one characteristic behavior relating to the index; and

(C) extracting a portion having the characteristic behavior in the times series data as an event timing to produce an event descriptor described by the event timing.

82. A storage medium storing a program for implementing in a computer a process for analyzing at least one system using an event descriptor relating to the system, the process comprising the steps of:

(A) obtaining time-series data of at least one index derived from at least one system;

(B) providing at least one characteristic behavior;

(C) extracting a portion having the characteristic behavior as an event timing in the time-series data; and

(D) analyzing the at least one event descriptor.

83. A storage medium storing a program for implementing in a computer a process for analyzing the relationship between a first index and a second index in a system, the process comprising the steps of:

(A) producing a first event descriptor relating to a first index using a method according to claim 1;

(B) producing a second event descriptor relating to a second index using a method according to claim 1; and

(C) comparing the first and second event descriptors

obtained in the steps (A) and (B).

84. A storage medium storing a program for implementing in a computer a process for analyzing the relationship between a first index from a first system and a second index from a second system, the process comprising the steps of:

(A) producing a first event descriptor relating to a first index using a method according to claim 1;

(B) producing a second event descriptor relating to a second index using a method according to claim 1; and

(C) comparing the first and second event descriptors obtained in the steps (A) and (B).

85. A storage medium storing a program for implementing in a computer a process for analyzing an index from a system using an event descriptor obtained using first and second characteristic behaviors, the process comprising the steps of:

(A) producing a first event descriptor relating to a first index using a method according to claim 1;

(B) producing a second event descriptor relating to a second index using a method according to claim 1; and

(C) comparing the first and second event descriptors obtained in the steps (A) and (B).

86. A storage medium storing a program for implementing in a computer a process for analyzing a system using a sequence of event descriptors relating to at least one system, the process comprising the steps of:

(A) obtaining time-series data of at least one index derived from at least one system;

(B) providing at least one characteristic behavior;

(C) extracting a portion having the characteristic

behavior as an event timing in the time-series data, and producing an event descriptor describing the event timing as a sequence; and

(D) analyzing the sequence.